Nursing Interventions of Children with Acute Disseminated Encephalomyelitis

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ABSTRACT

This paper aims to investigate the clinical features and nursing interventions of children with acute disseminated encephalomyelitis (ADEM). By randomly selecting the children with ADEM treated in our hospital as the study subjects, the relevant clinical data of these patients was analysed and then their clinical characteristics were compared. According to the randomized table method, the patients were divided into control group and study group, where the control group was given routine nursing care, while the study group was given comprehensive care, so as to compare and analyse the effects of the two groups. The results show that the incidence of ADEM in children has no significant difference in the four seasons, and the predisposing factors are related to respiratory tract infection, viral infection, gastrointestinal tract infection and vaccination. In terms of clinical typing, it includes brain type and cerebrospinal type. The clinical manifestations of ADEM are fever, limb spasms, and convulsions. Therefore, the clinical symptoms of ADEM are rather clear, and the timely symptomatic treatment and assisted effective nursing intervention can improve the therapeutic effect.

Key Words: Nursing Interventions; Acute Disseminated Encephalomyelitis

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Introduction

The clinical diagnosis of acute disseminated encephalomyelitis (ADEM) is based on acute or subacute symptoms or neuroimaging, without any specific diagnostic method (Debono *et al.*, 2013). Therefore, to master the clinical characteristics of children with ADEM is of great significance for improving the clinical diagnosis rate of children. In addition, relevant studies have demonstrated that effective nursing interventions in the treatment of children with ADEM have a definite effect on improving the prognosis of patients (Weissman, 1990). Current evidence suggests that ADEM is a transient autoimmune response against myelin or other autoantigens triggered by autologous T cell activation. Specifically, it may be related to the following mechanisms: The first is the molecular simulation hypothesis which is supportive for the patients with the viral infection and vaccination before illness; in this hypothesis, it is believed that partial similarity between the pathogen and the host structure induces T cell activation, but not enough to make it tolerant; Animal studies have found that injecting myelin protein components into healthy animals can induce acute, chronic, or relapsing-type encephalomyelitis (EAE). The second is the hypothesis that central nervous infection is the trigger factor. After the central nervous system infected, autoimmune reactions is stimulated; the infection also causes the destruction of the blood-brain barrier, resulting in the release of central self-associated antigens into the blood. The treatment of lymphoid organs breaks down the tolerance of T cells, causing the allergic reactions to the central nervous system. The third is the influence of cytokines. It's found cerebrospinal fluid of patients with ADEM,

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the IL-4, IL-10 and TNF-α increased, the number of myelin-reactive T cells in peripheral blood was more than ten times higher than that of normal people, and the number of CD3+T cells generating IFN-γ increased, but the number of CD4+T cells producing IL-17 did not increase, which was significantly increased only in MS patients. The fourth is the role of antibodies. In the serum of ADEM patients, the myelin basic protein (MBP) antibodies and myelin oligodendrocyte glycoprotein (MOG) antibodies can be detected; the latter is more common in children: after treatment, the MOG antibody disappears; if it persists, the patient eventually turns to be MS.

ADEM mostly occurs in 2 days to 4 weeks after virus infection, and a few occur after vaccination. Some patients have no incentive before illness. For the patients with clinical manifestations of multifocal neurological dysfunction suggesting that the central nervous system is widely involved, there may be unilateral or bilateral pyramidal signs (60-95%), acute hemiplegia (76%), ataxia (18- 65%), cranial nerve palsy (22-45%), optic neuritis (7-23%), epilepsy (13-35%), spinal cord involvement (24%), partial sensory disturbance (2-3%), speech obstacles (5-21%), which are often accompanied by disturbances of consciousness; fever and meningeal irritation are also common, and the incidence of respiratory failure secondary to brain stem damage or disturbance of consciousness is 11-16%.

In addition, ADEM is more prone to peripheral neuropathy than other demyelinating diseases of the central nervous system, and it is more prominent in adult patients. In one study, it's found that about 43.6% of ADEM was associated with peripheral neuropathy. In the definition of IPMMSG, patients are required to have the performance of encephalopathy, i.e. mental disorders, cognitive disorders or disturbances of consciousness. Previous studies have concluded that the incidence of encephalopathy is 42-83%, and the new definition may lead to some missed diagnosis, but it is easy to rule out those who are easily transformed into multiple sclerosis. Acute hemorrhagic leukoencephalitis, also known as Weston-Hurst disease, is a hyperacute variant of ADEM, manifesting as acute, rapidly progressive, fulminant inflammatory hemorrhagic demyelinating, mostly died of brain edema within one week or severe sequelae. Because of the lack of specific biomarkers, the diagnosis of ADEM is mostly based on clinical and radiographic features.

Methods

General information

A total of 40 children with ADEM who were admitted to our hospital between January 2010 and January 2015 were selected as study subjects. The patients were divided into one control group and one study group according to the randomized table method, with 20 cases in each group. In the control group, there were 11 males and 9 females, aged (7.3±2.5) years, with acute onset in 7 cases, subacute onset in 13 cases; viral infection before onset in 12 cases and vaccination history in 8 cases. The study group comprised 12 males and 8 females, aged (7.7±2.3) years, acute onset in 8 cases, subacute onset in 12 cases; viral infection before onset in 14 cases, and vaccination history in 6 cases. There was no significant difference (P>0.05) between the two groups of patients in terms of age, sex, and acute degree of onset, and they were comparable.

Experimental Method

Patients in the control group were treated with routine nursing interventions. Children in the study group were given comprehensive nursing interventions on the basis of routine care. The specific measures were as follows: 1. Assessment care. After the children were admitted to hospital, the related assessment was made to understand their body and psychological state, together with the parents of children to do comfort work for children and obtain the children's trust (Wilmore, 1991); 2. Psychological care. According to the understanding ability of children at different ages, individualized communication and care were taken, and individualized psychological nursing intervention was made, so as to gain the children's trust for the medical staff, and facilitate the implementation of therapeutic measures; 3. Music therapy. By playing children's songs, reading the fairy tales, and creating a cheerful treatment scenario, the emotional impatience of children could be released. According to the children's personality, the introvert-type children could listen to the soft music, while the extravert-type children listen to the funny and cheerful music (Slade *et al.*, 1975).

Statistical method

The SPSS 19.0 statistical analysis software was used to process the relevant data. The measurement data was represented by ($x\pm s$) and the t-test was used. The count data sets were compared using the X2 test, P<0.05, and the difference was statistically significant.

Results and discussion

The incidence of in 40 children with ADEM in all seasons was not significantly different, and the precipitating causes were respiratory infection, viral infections, digestive tract infection, and vaccination. The age of onset for children in this study was mainly 3-12 years old. Compared with relevant reports, the age of children is relatively low, as shown in Table 1.

In terms of clinic classification, twenty-five cases (62.5%) were brain type and 15 cases (37.5%) were cerebrospinal type, without any acute necrotic hemorrhage type. The clinical manifestations of brain-type children were mainly fever, and some children had headaches with syncope. The clinical manifestations of cerebrospinal-type children were mainly paralysis of limbs and convulsions. The details are shown in Tables 2 and 3.

Table 1. Analysis of clinical incidence in children

	n	Cause of cause	Age of onset
Spring	9	Respiratory infection	<3
Summer	8	Viral infection	3-7
Autumn	11	Gastrointestinal infection	7-12
Winter	12	vaccination	>12

Table 2. Clinical classification of children

	Clinical classification			
	Brain type	Cerebrospinal type	fever	Limb paralysis
n	25	15	24	23
Percentage(%)	62.5	37.5	60.0	57.5

Table 3. Clinical characteristics of children

	Clinical classification			
	Thriller	Mental symptoms	headache	Disturbance of consciousness
n	23	17	16	13
Percentage (%)	57.5	42.5	40.0	32.5

The abnormal rate of the indicators such as leukocyte, protein IgG index, and OB positive rate etc. was higher in children, besides, the neuroimaging showed that the children suffered mainly the white matter lesions, as shown in Tables 4 and 5. The length of hospital stay and OB positive rate in the study group were significantly better than those in the control group. The difference was statistically significant (P<0.05) (Table 6).

Table 4. Results of laboratory tests in children

	Laboratory test results		
	Leukocyte 10^9/L	Protein >0.4g/L	IgG index >0.7
n	16	19	21
Percentage (%)	40.0	47.5	52.5

Table 5. Results of medical imaging examination

	Medical imaging examination		
	OB positive	White matter lesions	Other lesions
n	24	35	5
Percentage (%)	60.0	87.5	12.5

Table 6. The length of hospital stay and OB positive rate in the study group

Groups	Hospital stay (d)	OB positive rate (%)
Control group	14.3±4.3	7 (17.5)
research group	8.4±3.5	0 (0.0)
t	4.759	8.485
P	0.000	0.004

Conclusion and prospect

ADEM is a more common neurological disease in children and adolescents, especially after viral infection or vaccination (Mcbride *et al.*, 1996). The clinical symptoms of acute disseminated encephalomyelitis are mostly neurological dysfunction, diffused brain or spinal cord injury, accompanied by quadriplegia or general phlegm, and respiratory failure, which seriously threatens the life and health of patients. ADEM is a rare disease with an annual morbidity of 0.2-0.8 per 100,000 and 80% of patients occur in children under the age of 10 years, which can also occur in adults but is rare (Loze *et al.*, 2001). 70-93% of patients had a history of infection or vaccination several weeks before the onset. Torisu *et al.*, reported that the incidence rate among children under 15 years of age was 0.64 per 100,000, and the average age of onset was 5.7 years, and the ratio of male and female was 2.3:1 (Di-Russo *et al.*, 2002). The incidence rate after vaccination was: ADEM 1:1000 to 1:20,000 for post-measles, with the highest incidence after measles vaccination. The occurrence of ADEM is age-related, more common in children, and the cause is unknown. It may be related to the immature myelin sheath in children or their immune response is different from that in adults. The iatrogenic factors may also lead to the occurrence of ADEM, such as kidney transplantation, application of brain tissue extracts, and testing of the Aβ42 vaccine for AD. During the Aβ42 vaccine trial, 6% of patients developed ADEM, whereas the placebo group did not. The main pathological

changes of ADEM include: disseminated demyelination changes in the brain, brainstem, cerebellum, and spinal cord; the white matter, temporal lobe, and optic nerve around the ventricle are prominent; demyelination often centres on the small veins; the small vein has inflammatory cell infiltration and its outer layer has the mononuclear cell-based infiltration of the surrounding tube, that is, vascular cuff; there is white matter myelinoclasis around the vein, and scattered glia cell proliferation. Besides, there are pathological difference between ADEM and MS: Firstly, the inflammatory lesions of ADEM extend radially from the small blood vessels, whereas the lesions of MS are mostly discontinuous; secondly, the phagocytic cells of ADEM surround the small blood vessels, while the phagocytic cells of MS surround the plaque. Thirdly, the boundaries of MS lesions are mostly clear, whereas ADEM lesions have blurred boundaries. Finally, in the later stage of the disease, for MS, there was a star-shaped cellular response with fibrin hyperplasia, whereas ADEM did not show this (Samuel *et al*., 2010).

Studies have reported that pre-infection or vaccination may increase the incidence of ADEM. All children in this study had varying degrees of respiratory infection, viral infection, gastrointestinal tract infection, and vaccination history before the onset of illness, confirming that the predisposing factors of acute disseminated encephalomyelitis are related to infection and vaccination.

There was no significant difference in the incidence of the four seasons in this study, suggesting that the occurrence of ADEM in children is not significantly related to the season. According to statistical data, the age of onset of the disease is 3-12 years old. In the clinical classification, 25 (62.5%) cases are brain type and 15 cases (37.5%) are cerebrospinal type. The clinical manifestations of brain-type children are mainly fever, and some children have headaches with syncope; the clinical manifestations of cerebro-spinal-type children are mainly paralysis of limbs and convulsions. ADEM in children affects the nervous system of patients, and in severe cases can lead to brain stem involvement and further complications such as respiratory failure that threaten the life and health of patients. In this group of patients, the clinical manifestations were mainly fever, limb spasm, which is similar to the results of relevant studies.

The results of laboratory tests showed that the abnormal rate of leukocyte, protein, IgG index, OB positive rate and other indicators were all higher; neuroimaging showed that the children were mainly white matter lesions. Therefore, it is suggested that the children during the onset of the disease will be affected in the change of blood leukocyte, protein, IgG and OB positive rates, and the white matter lesions are mostly visible in imaging examinations. Besides, the diagnosis of non-white matter lesions should also be guarded.

By analysing the clinical symptoms of children with ADEM, it can be seen that the incidence of the disease has nothing to do with the seasons, and the children with different clinical types show different clinical manifestations; so the symptomatic care for different clinical symptoms is helpful to improve the adjuvant treatment effect of the disease. Through this study, it is found that comprehensive care for children during treatment can effectively improve the patient's treatment effect, and compared with the control group in routine care, the study group with comprehensive nursing care is more significant.

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